

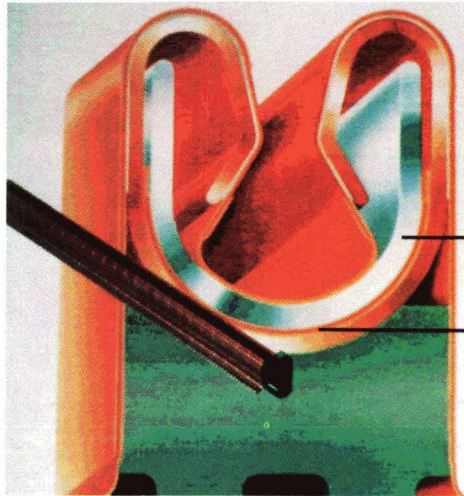
## Electrical Connectors

Electrical connectors are the single greatest limiting factor facing designers of high performance digital systems, according to John Krumme, President of Beta Phase, Inc., Menlo Park, California. Beta Phase, a pioneer in innovative connector technology since its founding in 1984, is offering designers what it calls "a new tool to help them do more in less space at less cost." The tool is a line of BetaFlex™ connectors/sockets that connect multichip modules and high density ceramic packages to printed circuit boards.

Aimed at computer, telecommunication, avionics and military markets, the BetaFlex line will enable designers to gain up to 40 percent more board space and provide 100 signal lines to the inch, according to Beta Phase. This is expected to lead to higher levels of miniaturization and a significant reduction in the cost of large scale integrated packages.

BetaFlex is a new technology for connectors, but actually it combines two well-proven technologies: photolithography and shape memory alloy. Beta Phase uses precision photolithography techniques to etch the contacts onto flexible circuits, thereby allowing a greater number of contacts in a given area, eliminating pins and sockets that might break, and reducing signal distortion.

Shape memory alloy technology is represented by a nickel-titanium element within the connector. When a low voltage power supply heats the alloy, it opens the connector's spring, allowing the mating printed circuit board to be inserted with zero force.

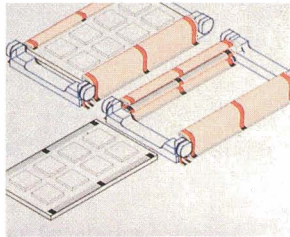


### BetaFlex™ Connector

Shape-Memory Alloy Opens Spring When Heated

Electrical Heater Triggers Shape-Memory Alloy

*The new  
connectors  
do more in  
less space at  
less cost*



This, says the company, provides the additional benefits of easier assembly and greater reliability than pin-and-socket connectors.

The spinoff connection is the shape memory alloy technology. The shape memory effect of nickel-titanium (whereby the metal can be severely deformed yet spring back to its original shape upon heating) was discovered in 1962 by the Naval Ordnance Laboratory. Although the discovery inspired a lot of industrial experiments, few practical applications emerged. In the 1970s and 1980s, NASA revived interest in the technology with a series of in-house and contractual projects involving further research on the shape memory properties of nickel-titanium, on procedures for processing the alloy, and on practical applications. NASA's work prompted wider adoption of the technology and brought about a number of practical applications.

In 1990, Beta Phase and Molex, Incorporated, a leading manufacturer of electronic connectors located in Lisle, Illinois, signed an agreement whereby Molex purchased a minority interest in Beta Phase and acquired the right to become an alternative source for Beta Phase connectors.

™BetaFlex is a trademark of Beta Phase, Inc.